



# Jack pine

(*Pinus banksiana*)

Since 1983, both the volume and rate of growth of jack pine have decreased significantly. The number of poles and sawtimber trees has decreased by 33-40% since 1996.

Jack pine has a much higher ratio of mortality to growth than other species in the state. For instance, jack pine accounts for about 1% of all volume and growth of trees in Wisconsin, but over 3% of mortality and removals. Volume of jack pine is predicted to decrease dramatically in the next 40 years.

Jack pine is an important timber species, accounting for 5.9% of roundwood product in 2009. We are harvesting over twice as much volume each year as is

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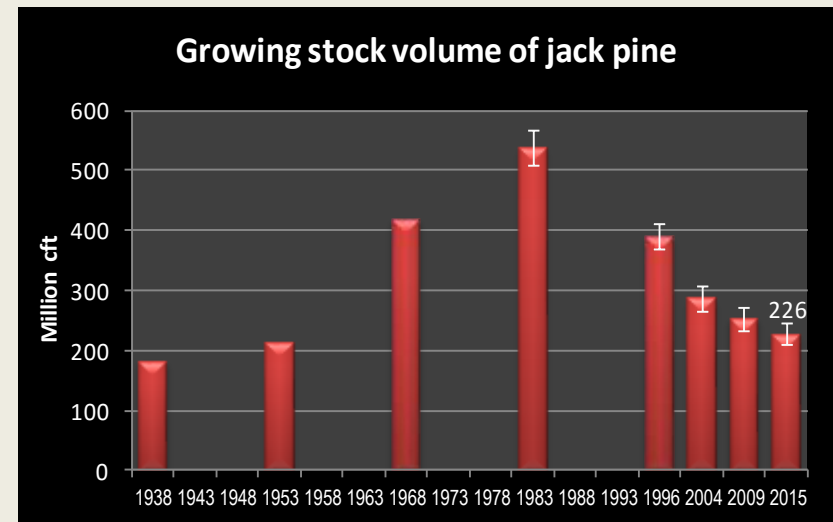
## *“How has the jack pine resource changed?”*

### Growing stock volume and diameter class distribution by year

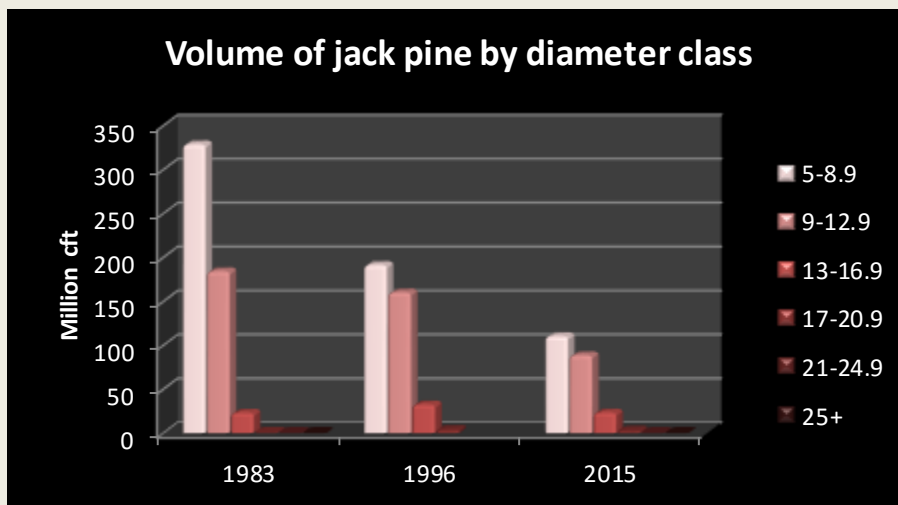
The [growing stock volume](#) of jack pine in 2015 was about 226 million cubic feet or 1% of total volume in the state (chart on right). Jack pine volume increased throughout the first half of the twentieth century but jack pine budworm caused mortality to increase dramatically in the 1980s and 1990s.

Volume in both small (5-13 inches dbh) and large ( $\geq 13$  inches dbh) growing stock trees has decreased significantly since 1996 (chart lower left).

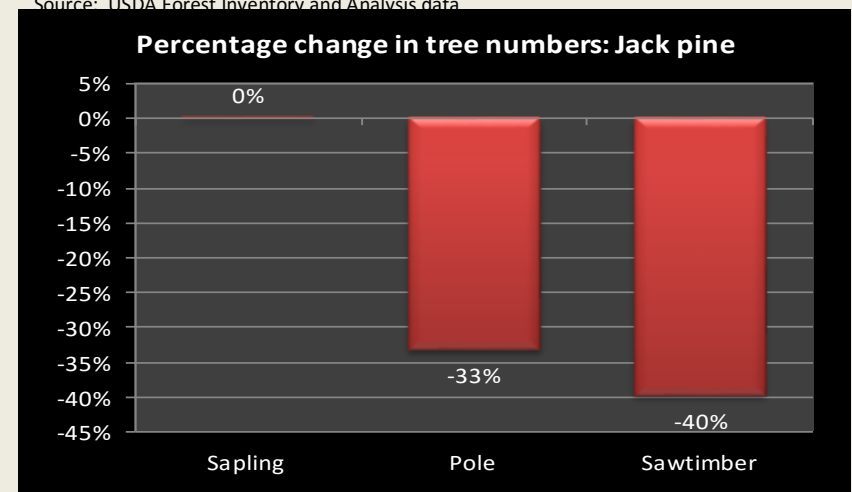
The number of jack pine trees has decreased for [pole](#) and [sawtimber](#)-sized trees while [saplings](#) numbers have not changed suggesting that jack pine populations will decrease in the future (chart lower right). Over three-quarters of all jack pine is naturally occurring (i.e. not planted).



Growing stock volume (million cubic feet) by inventory year.  
Source: USDA Forest Inventory and Analysis data



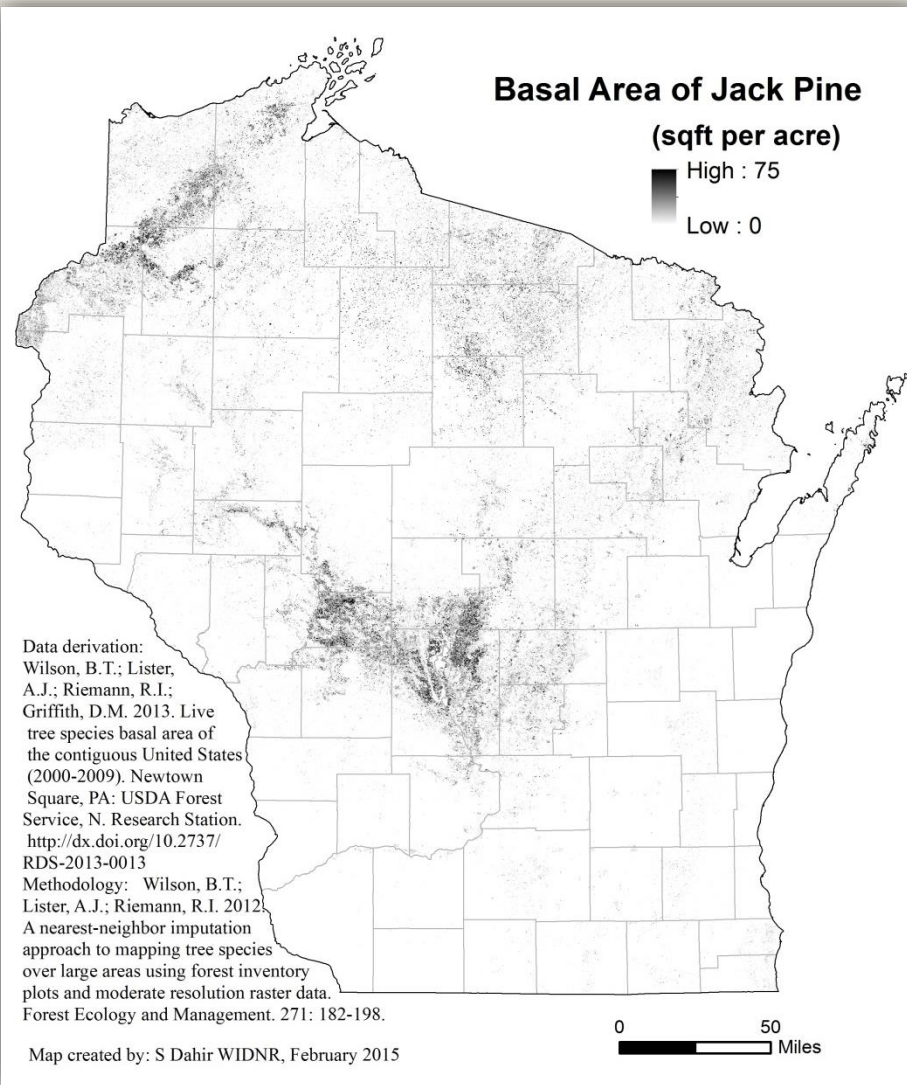
Growing stock volume (trees over 5 inches dbh) in million cubic feet  
Source: USDA Forest Inventory and Analysis data



Percentage change in the number of live trees by size class between 1996 and 2015.  
Source: USDA Forest Inventory and Analysis data 1996 and 2015.

*"Where does jack pine grow in Wisconsin?"*

**Growing stock volume by region with map**



About  $\frac{3}{4}$  of jack pine volume is found in the sandy soils of northwest and central Wisconsin with lesser amounts in the northeast (Table 1).

The vast majority of jack pine volume occurs on pine [forest types](#) with lesser amounts on oak/pine and oak/hickory types.

Table 1. Growing stock volume (million cft) by species and region of the state.

Species	Central	North east	North west	South east	South west	Total
Jack pine	91	55	78	1	0	226
Percent of total	40%	24%	35%	1%	0%	100%

Source: USDA Forest Service, Forest Inventory and Analysis 2015 data

For a table of **Volume by County** go to:

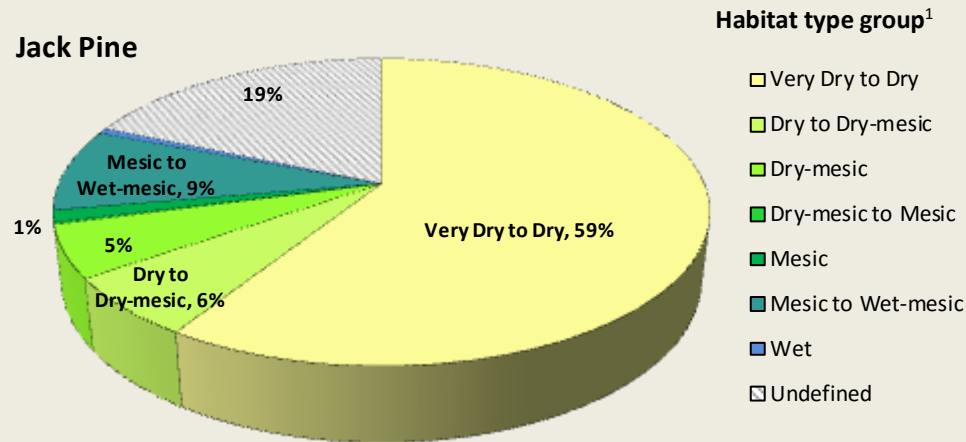
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/VolumeCountySpecies.pdf>



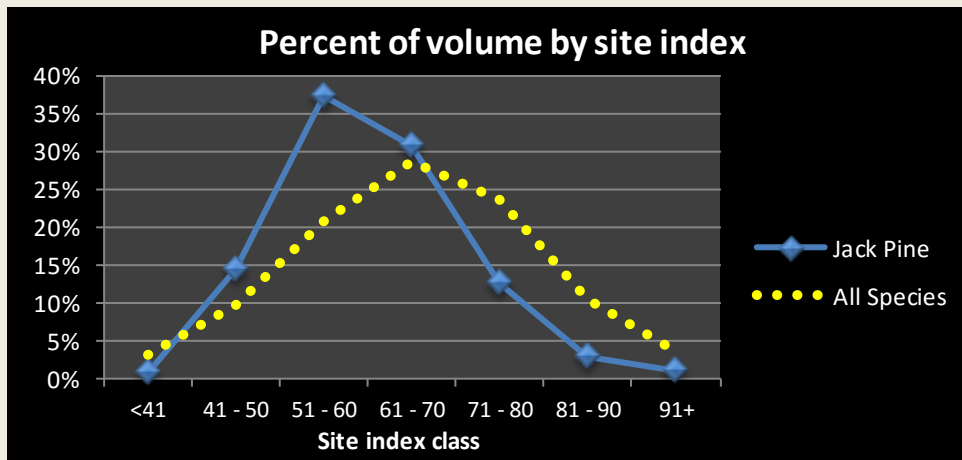
## *"What kind of sites does jack pine grow on?"*

### Habitat type<sup>1</sup> and site index distribution

Two thirds of jack pine growing stock volume is found on dry habitat types: very dry to dry and dry to dry-mesic (chart below).



Percent distribution of growing stock volume by habitat type group (USDA Forest Inventory & Analysis data).



Percent distribution of growing stock volume by site index class (USDA Forest Inventory & Analysis data).

The majority of jack pine growing stock volume is found in stands with low site indices (chart on left). Over half of volume is located on sites with site index less than 60.

The average site index by volume for jack pine is 61, much lower than the average for all species, 66.

<sup>1</sup> For more information on habitat types see Schmidt, Thomas L. 1997. Wisconsin forest statistics, 1996. Resource Bulletin NC-183. St. Paul, MN: U.S. Dept. of Agriculture, Forest Service, North Central



*"How fast is jack pine growing?"*

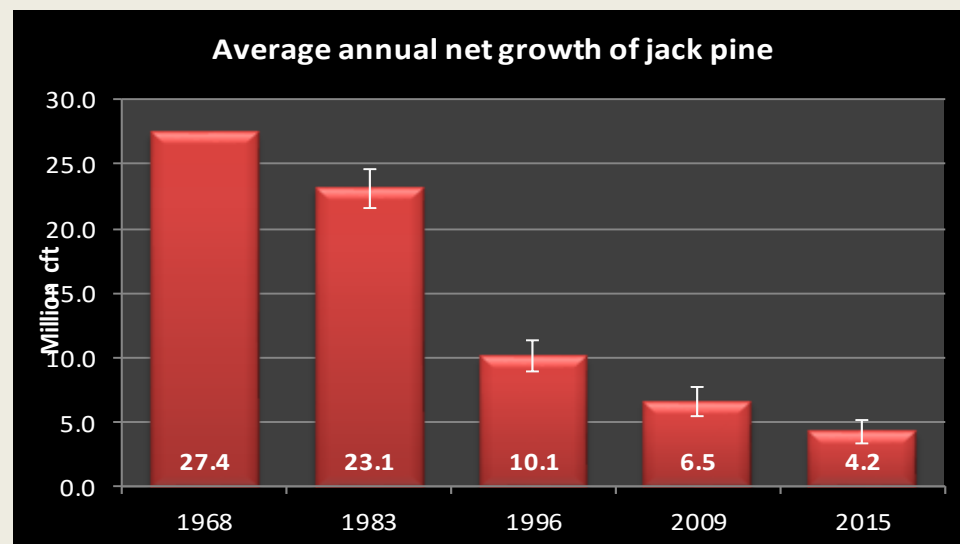
### Average annual net growth and the ratio of growth to volume

Average annual net growth of jack pine has decreased by 82% since 1983 to 4.2 million cubic feet per year currently (chart on right). This represents about 1% of total volume growth in Wisconsin.

Table 2. Average annual net growth (million cft/year) of growing stock and the ratio of growth to volume by region of the state.

Region	Net growth	Percent of Total	Ratio of growth to volume
Northeast	2.0	37%	3.7%
Northwest	1.8	32%	2.2%
Central	2.0	37%	2.2%
Southwest	-0.4	-7%	-88.4%
Southeast	0.0	0%	-1.1%
Statewide	5.4	100%	2.4%

Source: USDA Forest Inventory and Analysis



Average annual net growth (million cubic feet).  
Source: USDA Forest Inventory & Analysis data

There is almost no jack pine volume in southern Wisconsin. The highest ratio of growth to volume is in the northeast (Table 2).

The statewide ratio for jack pine is 2.4%, slightly lower than the average of 2.7% for all species.

For a table of **Average annual growth, mortality and removals by region** go to:

<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf>



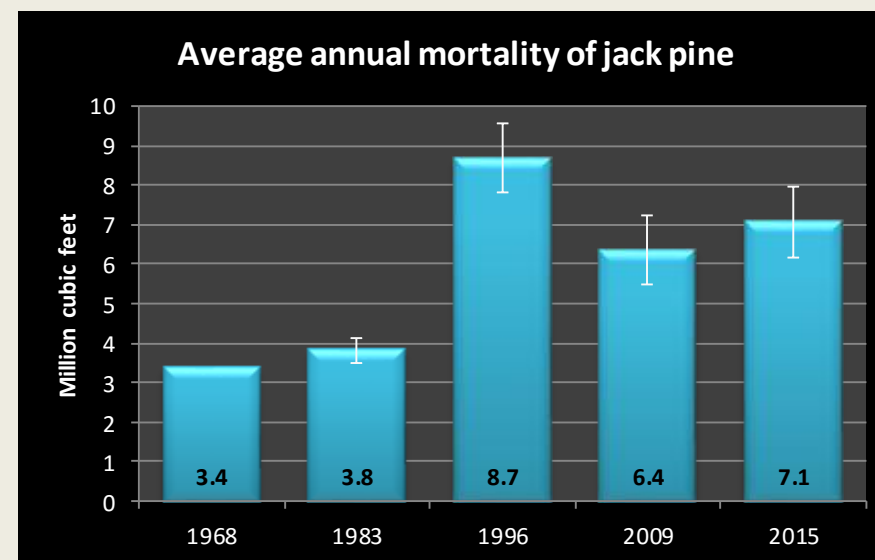


*"How healthy is jack pine in Wisconsin?"*

**Average annual mortality and the ratio of mortality to gross growth**

Average annual mortality of jack pine was 7.1 million cubic feet per year from 2010 to 2015 (chart on right). Mortality increased significantly between 1983 and 1996 probably due to jack pine budworm defoliation but has fallen 19% since 1996.

The ratio of mortality to volume is 3.1% for jack pine (Table 3), almost three times higher than the statewide average of 1.1%. Whereas jack pine accounts for 1% of total growing stock volume in the state, this species makes up 3% of total mortality.



Average annual mortality (million cubic feet) by inventory year.  
Source: USDA Forest Inventory & Analysis data

Table 3. Mortality, volume) and the ratio of mortality to volume of growing stock.

Species	Average annual mortality (cft)	Volume of growing stock (cft)	Mortality / volume
Jack Pine	7,069,531	225,859,599	3.1%

Source: USDA Forest Inventory & Analysis data

For a table of **Average annual growth, mortality and removals by region** go to:  
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf>

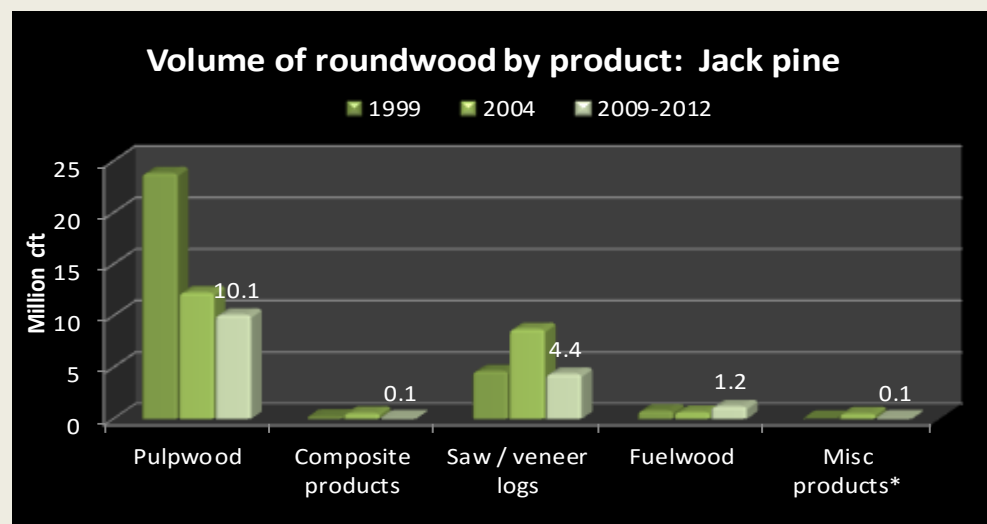


*"How much jack pine do we harvest?"*

## Roundwood production and the ratio of removals to growth

In 2009-2012, jack pine accounted for 15.9 million cubic feet or 4.1% of Wisconsin's total [roundwood](#) production. About 81% was used for pulpwood and 16% for sawlogs and veneer (chart on right). Jack pine sawlogs account for almost 6% of statewide production.

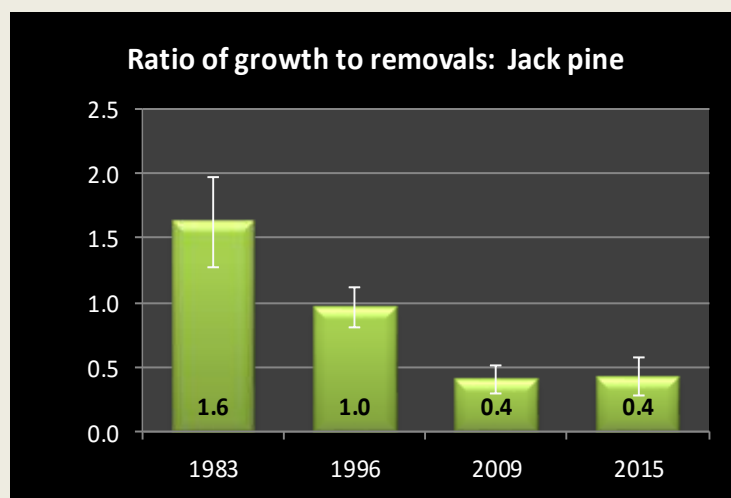
From 2004 to 2009, sawlog production had decreased 50%.



Volume of roundwood products. \* Miscellaneous products include poles, posts, and pilings.  
Source: Ronald Piva, USDA Forest Service, Northern Research Station, St. Paul MN

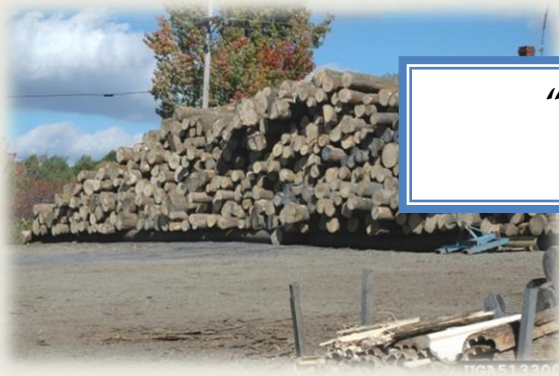
We harvest 9.9 million cubic feet of jack pine each year. This is down from almost 32 million cubic feet in 1983.

The ratio of average annual net growth to removals has fallen by 56% since 1983 and now stands at 0.4, much lower than the average of 1.7 for all species and second only to paper birch, a species which has a negative growth rate (chart 7).



Source: USDA Forest Inventory & Analysis data.

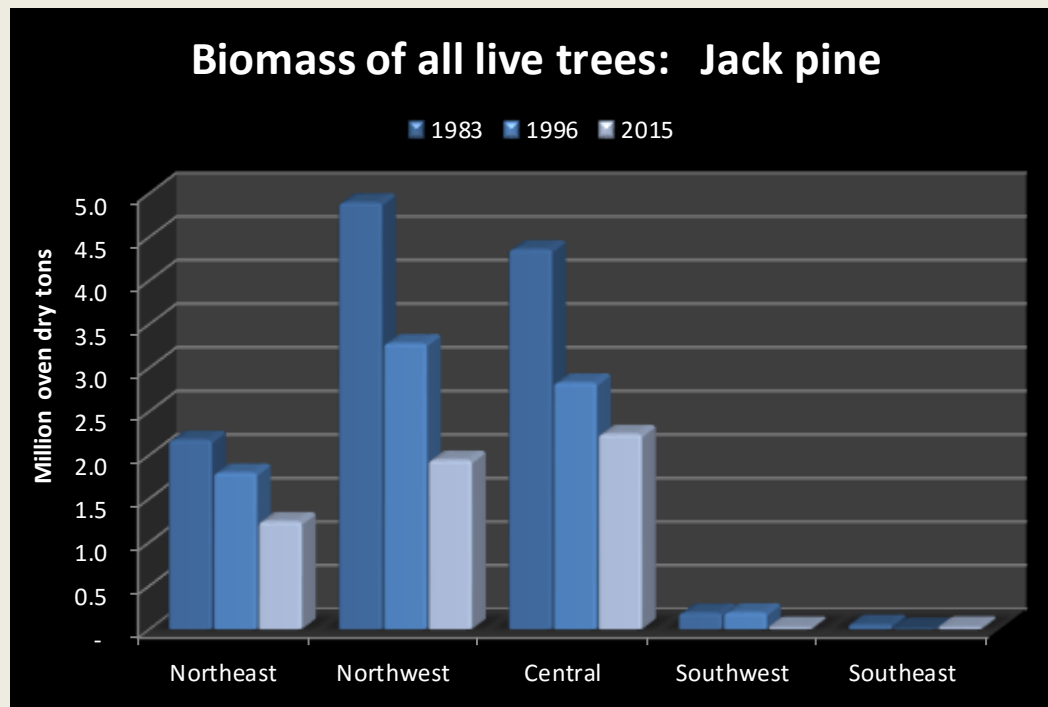
For a table of **Average annual growth, mortality and removals by region** go to:  
<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/GrowthMortalityRemovals.pdf>



*"How much jack pine biomass do we have?"*

### Aboveground biomass by region of the state

There were 5.5 million tons of aboveground [biomass](#) in live jack pine trees in 2015, a decrease of 53% from 1983. This is equivalent to approximately 2.7 million tons of carbon and represents 0.9% of all biomass statewide. As with volume, most jack pine is located in northwest and central Wisconsin (chart below).



The density of jack pine wood is fairly low with a ratio of biomass to volume of 29 oven-dry lbs. per cubic foot (ODP/cft). The average for all softwoods is about 26 ODP/cubic feet and for all species is 33 ODP/cubic feet. Approximately, 80% of all jack pine biomass is located in the main stem and 15% in the branches.

The declining volume of jack pine as well as the low density of its wood may make it a poorer choice for biomass production.

Biomass (above ground dry weight of live trees >1 in dbh, short tons) by year and region of the state.  
Source: USDA Forest Inventory & Analysis data

For a table of **Biomass by County** go to:

<http://dnr.wi.gov/topic/ForestBusinesses/documents/tables/BiomassByCounty.pdf>

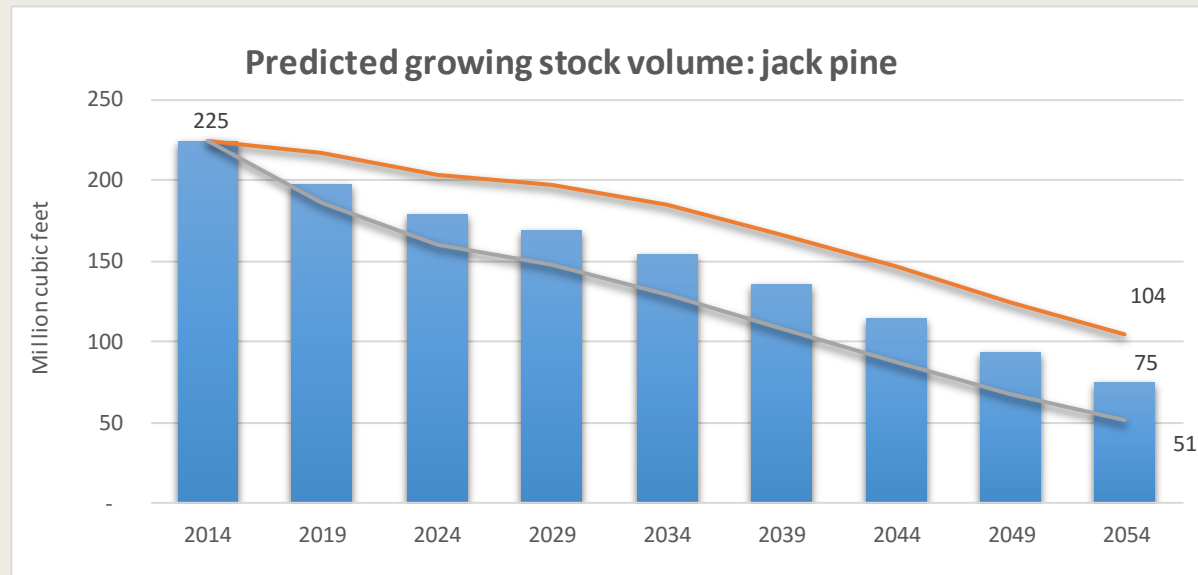
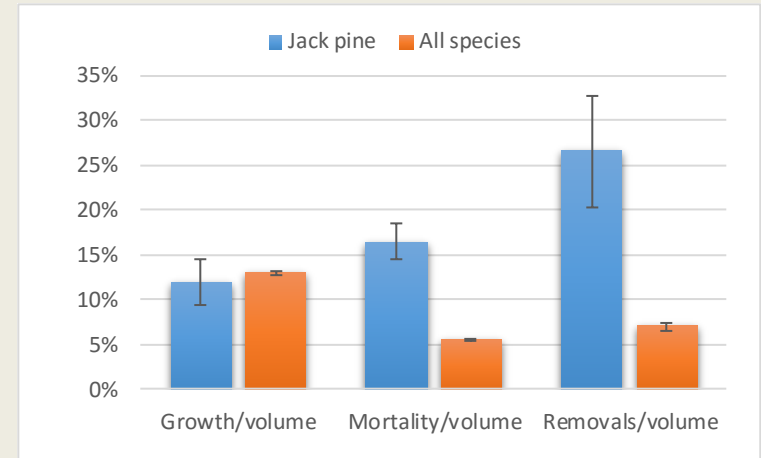


## *"Can we predict the future of jack pine?"*

### **Predicted volumes based on current rates of mortality and harvest**

The 5-year ratios of mortality to volume and removals to volume are much higher for jack pine compared to all species in the state (chart on right).

The Forest Vegetation Simulator (FVS<sup>1</sup>) was used to predict future volumes of jack pine through 2054. Three scenarios are forecast. One with current rates of mortality and removals (i.e. average annual mortality and removals for 2009 to 2014). Another with current mortality rates and the lower 67% confidence interval for current removals and another with the upper 67% confidence interval for removals.



As would be expected with such high rate of removals and mortality, jack pine volume decreases significantly regardless of harvest rates. By 2054, volume is 67% lower for current removal levels, 54% lower for low removals and 77% lower for high removals.